IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	MARKUS HARTMANN and HELMUT JAROSCH
Serial No.:	10/577,181
Filed:	April 25, 2006
For:	METHOD FOR THE PRODUCTION OF A THERMOPLASTIC BOARD COMPRISING AT LEAST ONE SMOOTH EDGE, DEVICE THEREFORE, AND EDGE MACHINING SYSTEM
Art Unit:	1791
Examiner:	Stella Kim Yi
Customer No.:	10037
Confirmation No:	1427

September 7, 2010

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPLICANT'S APPEAL BRIEF

Sir:

In response to the Notice of Appeal dated July 7, 2010, applicant herewith presents its Appeal Brief pursuant to 37 C.F.R. 41.37.

(i) *Real party in interest.*

The real party in interest is VEKA AG

(ii) *Related appeals and interferences.*

There are no related appeals or interferences.

(iii) *Status of claims.*

Claims 1, 2 and 4 are rejected.

The rejection of claims 1, 2 and 4 is appealed.

(iv) *Status of amendments.*

The proposed amendment after final rejection will be entered for purposes of appeal.

(v) *Summary of claimed subject matter.*

The present invention, according to claim 1, provides a method for manufacturing a thermoplastic synthetic integral foam board (Fig. 1, 20, [0034]) having a coarsely porous core ([0003]), sealed and smoothed side surfaces and at least one sealed and smoothed side edge ([0002], [0006], said method comprising the steps of:

- mixing a thermoplastic synthetic material in an extruder (original claim 1, [0034]);
- extruding the thermoplastic synthetic material through a wide-slot nozzle to form a flat plastic web having a coarsely porous core (original claim 1, [0034], [0003]);
- cooling and calibrating the plastic web on a calendar roll pair to form sealed and smoothed side surfaces (original claim 1, [0016], [0007], [0019], [0049], Fig. 4);
- drawing off the plastic web (original claim 1); and
- heating the side edge of the plastic web in a guide groove of a smoothing device to at least a melting temperature of the thermoplastic synthetic material following calibration (original claim 1, [0007], [0035], fig. 1, fig. 4), while pressing the contact surface of the smoothing device against the-side edge to smooth and densify the thermoplastic synthetic material ([0009], [0010], [0013], [0035]), thereby to smooth and seal the side edge of the coarsely porous core ([0002], [0006]) while simultaneously maintaining adjacent peripheral surface areas of the plastic web in the smoothing device at a temperature below the softening temperature of the thermoplastic synthetic material by cooling ([0007], [0008], [0011], [0015], [0016], [0019], [0020], [0021], [0037], [0041], [0044], [0049], fig. 3 16-17).

The invention as further provided by claim 2, provides the method as set forth in claim 1, wherein the thermoplastic synthetic material is hard PVC ([0039]).

The invention as further provided by claim 4 provides the method as set forth in claim 1, wherein a longitudinal side of the plastic web is trimmed prior to heating the side edge (original claim 4, [0003], [0004], fig. 1 31-32).

(vi) *Grounds of rejection to be reviewed on appeal.*

Claims 1, 2 and 4 are rejected as being obvious under 35 U.S.C. § 103 over Bressan (EP 0303576) and in view of Day (5,589,243).

(vii) *Argument.*

REJECTION

Claims 1-2 and 4 are rejected under 35 U.S.C. 1 03(a) as being unpatentable over Bressan (EP 0303576) and in view of Day (5,589,243).

CLAIMS 1 AND 4

A feature of this invention is that the foam core is generally maintained, while the surface and edge are densified and smoothed. Such a process inherently displaces gas from the foam at the surfaces, while leaving the cell structure of the foam core intact.

Claim 1, indeed, expressly recites these attributes. Thus, the preamble of claim 1 recites "A method for manufacturing a thermoplastic synthetic integral foam board having a coarsely porous core, sealed and smoothed side surfaces and at least one sealed and smoothed side edge", while the remainder of the claim recites features of the method which result in such a board.

The invention according to claim 1 thus relates to a method of forming a thermoplastic foam core sheet having a smooth skin on both faces, which is later processed to have a smooth dense shell on an edge, formed without softening an adjacent portion of the sheet by simultaneously heating the edge to a melting temperature while cooling the adjacent areas below a softening temperature. The result is a foam core sheet which has a smooth, dense edge, which is formed in two operations (formation of a sheet of arbitrary width having solid surfaces and a porous foam core; followed by formation of smooth dense edges at defined locations), and thus permits arbitrary width, edge-finished panels to be formed.

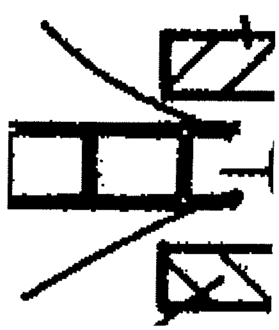
Foam core panels are known in the art, but the art is deficient in processes for forming smooth edges on arbitrary width panels. Foam core panels are suitable as insulating panels. Day, US 5,589,243 provides an example of such panels. Day discusses foam core sheet, which is admittedly old. However, Day, and the known art, suffer from a problem that a cut sheet has an

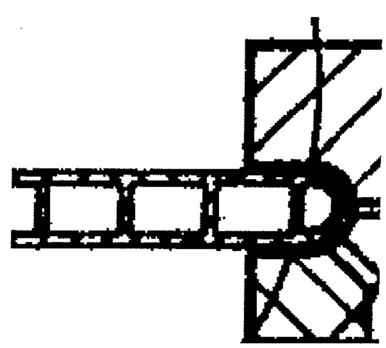
exposed foam core edge. Indeed, Day suffers from the further problem that the edges of a cut fibrous material impregnated with a curable resin, are also exposed.

Bressan, EP 0303576, relates to a method and apparatus for thermoforming "semi-finished" products extruded in the form of continuous alveolate sheets. An alveolate sheet has a pair of faces formed of thermoplastic, with parallel bridging spacers perpendicular across the space between the sheets. Therefore, the alveolate sheet has continuous air channels across the entire width of the sheet, and a direct air space between faces of the sheet, resulting in poor insulating properties. An alveolate sheet is not a "thermoplastic synthetic integral foam board having a coarsely porous core" as encompassed by claim 1, and Bressan is thereby clearly distinguished.

Bressan discloses a process for producing an alveolate thermoplastic plate. Such a plate has parallel sheets of thermoplastic film, separated by a set of perpendicular spacers, which form continuous parallel channels across the sheet. The edge treatment involves softening the cut edges of the surface sheets, bending them together, and fusing them with heat to form a curved edge. This is an altogether different process from smoothing and densifying the foamed thermoplastic material according to the present invention. The foam board thermoplastic material according to the present claims is suitable for insulating and structural purposes, and has a generally homogeneous foam core; the alveolate sheet according to Bressan is anisotropic and comprises various discrete regions of open space and thermoplastic bridging film. Bressan does not teach a foam core structure, and does not teach or suggest any process which densifies or smoothes any surface of the exposed core in its process. While it does fuse two edges, these are not considered "surfaces", and are distinguished.

The process of Bressan forms an edge on the alveolate sheet by deforming and heating an H-shaped cross section so that the free edges verge toward each other, and bridging the edges by fusing the thermoplastic free edges. See Figs. 6 and 7 of Bressan, which represent successive stages of the process:





If one were to seek to apply the method of Bressan to the sheet of Day (or indeed any foam core sheet), the result would be quite different to that of the present invention. For one, Bressan seeks to bridge the surfaces of the parallel sheets into a curved edge. The present invention addresses the issue of forming a smooth and densified edge on such a foam core sheet, without disrupting the foam core and sheet dimensionality in general. Thus, while the edge must be heated sufficiently to release trapped gas in the thermoplastic foam, leading to a high density surface region, the heating profile is maintained so that deeper regions of the sheet remain foamed.

Thus in addition to starting with a different material than defined by claim 1, the process of Bressan thus fails to teach or suggest at least "heating the side edge of the plastic web in a guide groove of a smoothing device to at least a melting temperature of the thermoplastic synthetic material following calibration, while pressing the contact surface of the smoothing device against the-side edge to **smooth and densify** the thermoplastic synthetic material, thereby **to smooth and seal the side edge of the coarsely porous core** while **simultaneously maintaining adjacent peripheral surface areas of the plastic web in the smoothing device at a temperature below the softening temperature of the thermoplastic synthetic material by cooling**."

Bressan discloses a method of closing the edges of a "continuous, alveolate sheet or panel". Applicants' "integral foam board" on the other hand, is formed of a plastic material having a "coarsely porous core"; that is, a solid material with numerous tiny bubbles which share walls with adjacent bubbles, formed by a process of surfaced tension, and which are not regularly arranged, and side surfaces which are sealed and smoothed during the manufacturing process to form a skin. Bressan forms a smooth edge by **deflecting** the free edges of the regularly arranged surfaces of the extruded structure toward each other and fusing the edges. Claim 1 encompasses smoothing and densifying the side edges of the plastic foam board, in a process which does not deflect the opposing surfaces, so much as to deform the rectangular edge with an exposed foam into a sealed, curved edge.

According to claim 1, a side edge surface is smoothed while simultaneously cooling the main surfaces of the board on either side. Bressan not only relates to a different type of plastic sheet, but also calls for a discrete two-step process of treating an edge (deflection, followed by fusion), which materially differs from that claimed.

In order to employ Day in the process of Bressan, the core of the Day board would have to be hollowed out, in order to form the open cavities which Bressan seeks to close by **deflection** of the opposing surfaces.

Bressan specifically teaches:

> According to the method and the apparatus of this invention the thermoforming assemblies are in line with the extrusion machine and provide first the softening of the peripheral edges which have been suitably cut and trimmed and then the junction thereof, thus forming the peripheral edges of a plurality of sheets subjected to said thermoforming action.
>
> As mentioned before, in order to avoid that the alveolate cavities of sheet 1 communicate with the outside the so-called "canes" should be closed by a thermoforming process acting on the side edges of the extruded sheet. In Figs. 2, 3 and 11 there is shown a cutting and thermoforming station for the side edges of alveolate sheet 1. Sheet 1 is cut by blades 34 and 34' at the entrance into the cutting and thermoforming station. Blade 34 longitudinally cuts sheet 1 along an axis thereof, and blades 34', as shown also in Fig. 5, cut and trim the edges of sheet 1, **thus eliminating the selvedge which is deformed by thermal effect upon the extrusion, in order to provide two correctly aligned side edges which will be closed by the thermoforming assemblies**. Sheet 1 is then passed about first deflecting rollers 32.The two halves of sheet 1 longitudinally cut by blade 34 are conveyed upwards and downwards, respectively, and passed about second deflecting rollers 33. Afterwards the cut edges of sheet 1 are subjected to a thermal action by assembly 6 which through electrical resistance 8 protected by insulator 9 produces heat which is irradiated through flanges 10 and 10' and softens edges 4 and 4' of sheet 1 guided between skids 11 and 11' in which cooling water fed through conduits 41 is circulated. Sheet 1 is then passed along forming assembly 12, better shown in Fig. 7, which by means of its shaped sections 13 and 13' joins by contact softened edges 4 and 4', thus closing the side edge of alveolate sheet 1.The alternative embodiment of Fig.8 shows assembly 12 provided with ducts 14 and 15 conveying cooling air from duct 35 towards sheet 1 so that the heating action of assembly 6 does not impair the evenness of sheet surfaces and the alveolate cavities adjacent to the outer edge to be treated. According to this embodiment assembly 12 is formed of two specular halves 12a and 12b, the distance of which can be adjusted in order to adapt forming assembly 12 to the different thickness of the semi-finished product 1.
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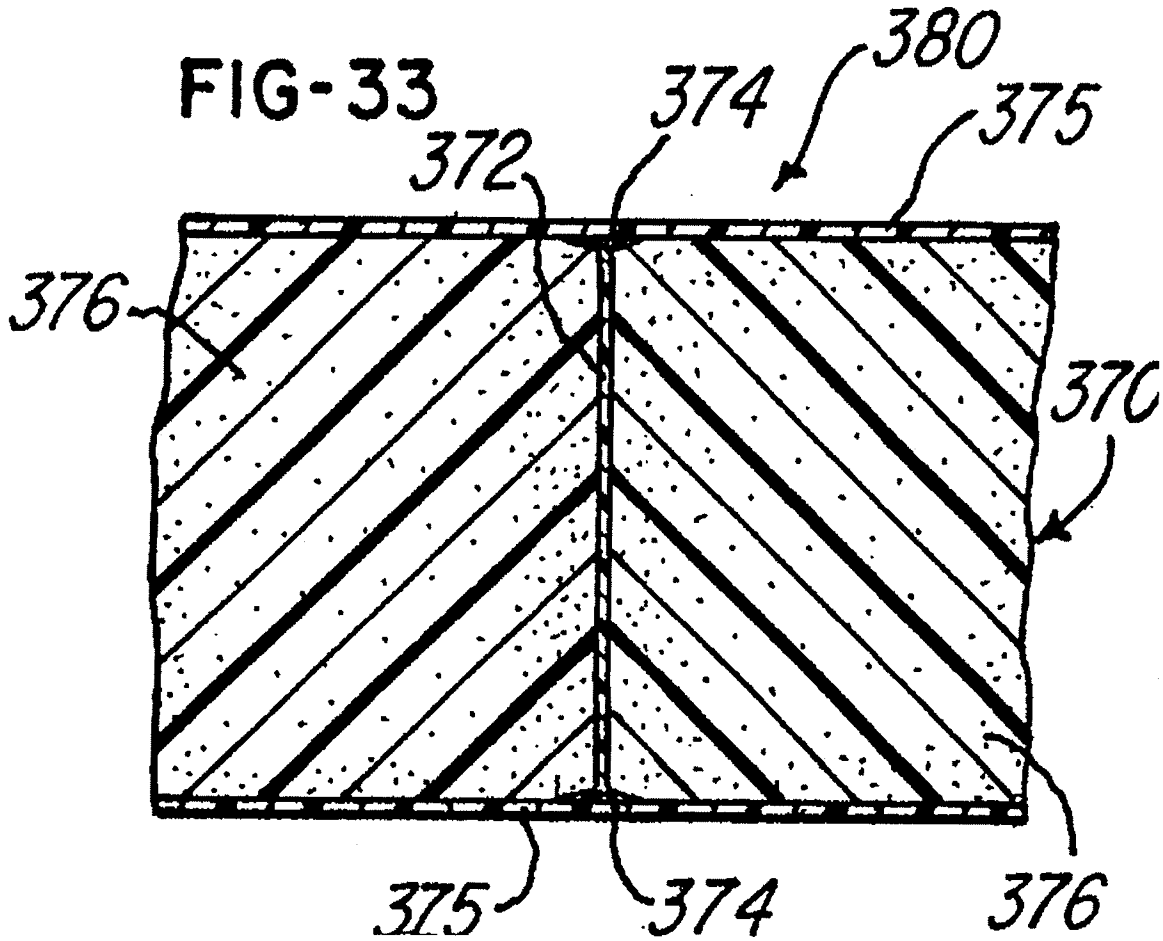
> * * *
>
> In Fig. 12 and 13 another embodiment of deflection station for alveolate sheet 1 is shown. This arrangement allows a pair of deflection rollers to be eliminated by arranging thermoforming assemblies 6, 12 along an oblique path of sheet 1 which after being cut is deflected by rollers 32' and conveyed at an angle upwards and downwards. Sheet 1 is subjected to thermoforming treatment along the oblique path as described above and then deflected again by rollers 33' and 32'.

Thus, it is clear that Bressan provides that the edge is formed by a deflection and fusion of a spaced pair of surfaces separated by a hollow space, while the present invention provides

that the edge is formed by a densification and smoothing of the edge of a foam core board, without collapsing an empty space. This difference is critical, and amounts to a failure of Bressan in view of Day to present a prima facie case of obviousness. Likewise, because Bressan teaches that the opposing surfaces are to be heated to a softening temperature and deflected, it teaches against the present invention which smoothes and densifies an edge of a foam core panel while simultaneously cooling adjacent peripheral surface areas to avoid deforming the surfaces, leaving them flat and parallel.

Day discloses a rigid foam board. However, Day teaches away from the applicants' method for smoothing and sealing a side edge. In particular, as shown in Fig. 33, the side surfaces 375 of the rigid, closed cell expanded foam board 370 are formed by "fiberglass skins" (Column 16, lines 23-33):

FIG-33



A resin, which is preferably injected into the fiberglass skins, not only penetrates between the fibers of these skins but also between fibers of intermediate webs 372 that extend between the fiberglass surfaces 375.

Note that neither the curable resin which forms the face material (polyester or polyurethane, Col. 7, line 28), nor the fiberglass or cellulose material is a **thermoplastic**. Day specifically discusses curing (polymerization) of the resin, which means that it would not normally reversibly soften and harden in response to temperature variations.

The present claim encompasses a homogeneous solid material, "thermoplastic synthetic **integral** foam board", and thus Day is distinguished.

Therefore, while Day does disclose thermo-formable foam boards, these boards are sandwiched together with the absorptive fibrous web sheets to form laminated boards which are not **integral**. Day fails to hint at the problem, or provide a solution to the problem, of porous edges which occur with an integral foam core board. Column 7, lines 60-61, the passage cited by the Examiner, merely states that "when fibrous sheets 42 [sheets equivalent to side surfaces 375 in Fig. 33] are cut by a band saw, the cutting operation frays the longitudinal edges of the webs 62 [intermediate webs 372 in Fig. 33]." Thus it is webs 62, not the porous core material, which is rough and unsightly. These frayed edges result only from the fibrous structure of the sheet material (fiberglass). The problems resulting from the rough cut edge of the coarse porous core foam board are neither disclosed nor alleviated by the manufacturing process of Day, and clearly are not disclosed in, or remediated by, Bressan.

In particular, the combination of Bressan and Day fails to teach or suggest at least the step of "heating the side edge of the plastic web in a guide groove of a smoothing device to at least a melting temperature of the thermoplastic synthetic material following calibration, while pressing the contact surface of the smoothing device against the side edge **to smooth and densify** the thermoplastic synthetic material, thereby to **smooth and seal the side edge of the coarsely porous core** while **simultaneously maintaining adjacent peripheral surface areas of the plastic web in the smoothing device at a temperature below the softening temperature of the thermoplastic synthetic material by cooling**."

Therefore, a person of ordinary skill in the art would have received no assistance from Day in smoothing the rough edges of a plastic porous foam board. Conversely, the frayed edges of non-thermoplastic fibers of a sheet material in a sandwich panel of the type disclosed by Day could not possibly be smoothed, and sealed, by the method according to Bressan, especially since the very surfaces which are the subject of softening, deflection and fusion according to

Bressan are curable resin, and not thermoplastic, in accordance with Day, and the proposed process would fail.

Finally, if a person skilled in the art were to substitute the resin-impregnated, fibrous surface covered, plastic porous foam as taught by Day for the thermoplastic structured sheet material of Bressan, the result might be a reinforced sandwich panel made of a number of porous plastic blocks, reinforced with a web of fibrous sheets. This structure would be completely different from the integral foam board of the present invention.

In summary, Day fails to mention the problems of sealing and smoothing the edges of an integral foam board. The panel disclosed by Day is coated with a separate "skin" to improve the strength and stability of the laminate (Column 8, lines 51-67). There is no hint or suggestion of smoothing and densifying the porous thermoplastic core itself.

In order to combine Day to remedy the deficiencies of Bressan, significant changes would be required, to alter the material composition of the Day panels. Neither reference teaches or suggests any such modification, and therefore the combination of references is not enabling for the rejection as proposed. Likewise, it is believed that the combination also fails to present a *prima facie* case of obviousness.

Addressing in particular the analysis proposed by the examiner, applicant notes as follows:

Bressan fails to teach or suggest "cooling and calibrating the plastic web on a calendar roll pair to form sealed and smoothed side surfaces". Col. 4, lines 45-51, cited by the examiner for this proposition, provides:

> "In Figs. 2, 3 and 11 there is shown a cutting and thermoforming station for the side edges of alveolate sheet 1. Sheet 1 is cut by blades 34 and 34 min at the entrance into the cutting and thermoforming station. Blade 34 longitudinally cuts sheet 1 along an axis thereof, and blades 34 min , as shown also in Fig. 5, cut and trim the edges of sheet 1, thus eliminating the selvedge which is deformed by thermal effect upon the extrusion, in order to provide two correctly aligned side edges which will be closed by the thermoforming assemblies."

In particular, no calendar roll is disclosed, and therefore this could not be the means for cooling and calibrating a plastic web to form sealed and smoothed side surfaces. It is believed

that the thermoplastic sheets which form the alveolate sheet of Bressan are already smooth and sealed, well before any part of Bressan's process commences. A calendar roll applies a pressure to form a smooth surface, and any such roll would surely crush the alveolate sheet, especially if the extruded alveolate sheet were cooled on such a roll.

Bressan fails to teach or suggest "drawing off the plastic web". Col.1, lines 4-15, cited by the examiner for this proposition provides:

> "This invention relates to a method of and an apparatus for thermoforming semi-finished products extruded in form of continuous, alveolate sheets or panels, in particular of polypropylene, comprising the steps and the devices, respectively, of extruding, feeding, treating and finishing the products which are interacting and correlated to one another and the product obtained therefrom as well as the phases and the means for cutting, shaping and thermoforming the semi-finished product and parts thereof obtained from the above mentioned processing steps."

It is respectfully submitted that no plastic web is drawn off a calendar roll in any aspect of the disclosure of Bressan.

Bressan fails to teach or suggest "pressing the contact surface of the smoothing device against the-side edge to smooth and densify the thermoplastic synthetic material, thereby to smooth and seal the side edge of the coarsely porous core whil e simultaneously maintaining adjacent peripheral surface areas of the plastic web in the smoothing device at a temperature below the softening temperature of the thermoplastic synthetic material by cooling." Col.2, lines 5-7, Col.5, lines 24-27, Col.5, lines 32-33; 36-39, Col. 4, line 59 through Col. 5, line 18 of Bressan provide:

> "This invention relates, according to a first aspect thereof, a method of manufacturing a semi-finished product in such a way as to avoid the above mentioned problems, wherein the forming is carried out directly during the step of extrusion of the sheet and the step of longitudinal and cross-cutting. The method essentially provide the steps of:"
>
> "The fine adjustment serves to keep the gap between side edges 4, 4' cut by blade 34 and thermoforming assemblies 6, 12 essentially constant. To this end support basement 37 is driven by an alternative step motor 36 responsive to a signal which is generated by a sensor (not shown) of said gap."

"Motor 36 draws near or move away assemblies 6,12 from sheet 1 so that the thermoforming action can be carried out under steady condition. The transmission of movement is effected by means of a bellow junction box 38 and an endless screw 39 engaging the threaded end of shaft 40 on which basement 37 supporting thermoforming assemblies 6, 12 is mounted (Fig. 10)."

"Afterwards the cut edges of sheet 1 are subjected to a thermal action by assembly 6 which through electrical resistance 8 protected by insulator 9 produces heat which is irradiated through flanges 10 and 10 min and softens edges 4 and 4 min of sheet 1 guided between skids 11 and 11 min in which cooling water fed through conduits 41 is circulated. Sheet 1 is then passed along forming assembly 12, better shown in Fig. 7, which by means of its shaped sections 13 and 13 min joins by contact softened edges 4 and 4 min , thus closing the side edge of alveolate sheet 1.The alternative embodiment of Fig.8 shows assembly 12 provided with ducts 14 and 15 conveying cooling air from duct 35 towards sheet 1 so that the heating action of assembly 6 does not impair the evenness of sheet surfaces and the alveolate cavities adjacent to the outer edge to be treated. According to this embodiment assembly 12 is formed of two specular halves 12a and 12b, the distance of which can be adjusted in order to adapt forming assembly 12 to the different thickness of the semi-finished product 1."

Bressan does not densify the thermoplastic material, and does not smooth and seal the side edge of the coarsely porous core.

While Bressan does disclose cooling, the qualitative differences between an alveolate sheet and a coarsely porous core thermoplastic synthetic integral foam board make Bressan's configuration impossible to extrapolate for use in a materially different environment, without the exercise of inventive skill.

In reviewing this analysis, it is clear that Bressan relates to a quite different material from that specified in the present claims, an alveolate sheet, i.e., one having a regular structure of open spaces, forming parallel conduits through the sheet, wherein the polypropylene material itself is solid and un-foamed.

The examiner admits that Bressan does not explicitly disclose that the thermoplastic sheet comprises a porous core. However, Day discloses that panel applications are commonly made from plastic extruded porous foam cores such as polyvinyl chloride (PVC) formulations (Col. 1,

lines 63-66 and Col.2, lines 33-36). Day discloses that a problem of fraying occurs along the longitudinal edges of the web after the said plastic porous foam is cut (Col.7, lines 60-61). The examiner therefore concludes that "It would have been obvious to one of ordinary skill in the art to have substituted the plastic porous foam as taught by DAY for the thermoplastic material of BRESSAN for the predictable results of manufacturing a thermoplastic foam board having a coarsely porous core and to seal and smooth the fray edges of the said plastic porous foam web."

The examiner's conclusion is in factual error, since the frayed edges of Day extend from a curable resin impregnated fibrous layer, and therefore the heating process of Bressan would not have smoothed the frayed edge, and perhaps could exaggerate the problem since the core material would shrink away from the heated edge, while the resin would remain stable or collapse, exposing the fibrous material.

In addition to the distinctions drawn above in the main part of the analysis, this rejection fails because the foam core panels of Day are non-analogous with the alveolate sheets of Bressan. These are formed of different materials, and used for different purposes.

Claim 4 is grouped with claim 1.

Reversal of the rejections of claims 1 and 4 are respectfully requested.

CLAIM 2

Claim 2 provides a method as set forth in claim 1, wherein the thermoplastic synthetic material is hard PVC [polyvinyl chloride].

While Day does disclose a plastic foam core PVC sheet, the examiner does not propose any advantage of a process according to Bressan as applied to the simple PVC foam core sheet; rather, it is the frayed edges that, according to the examiner, compel the combination. However, as discussed above with respect to claim 1, the fibrous layer of Day is impregnated with a curable resin, which is incompatible with a thermal smoothing and densification process. Indeed, Day more suggests use of a polyisocyanurate foam (a thermoset, and not a thermoplastic) as the core material, and relegates thermoplastics as frangible, rather than structural components (Col. 9, line 64-Col. 10, line 4), which are used <u>in place of</u> the fibrous sheets 42, and therefore lacking the fibrous faces which give rise to the problem relied upon by the examiner:

> It is also within the scope of the invention to produce a core panel similar to the core panel 85 wherein relatively low density closed or open cell crushable foam sheets or

low density thermo-formable plastic sheets with a heat softening temperature substantially less than that of the foam boards 40, are used in place of the fibrous sheets 42 to form the crossing or intersecting webs. When the panel is curved, for example to form a boat hull, the webs are crushed or are heat-formed, avoiding the creation of undesirable gaps or voids between the foam blocks formed from the boards 40.

Therefore, it is believed that the examiner has not established a prima facie case of obviousness of claim 2.

Reversal of the rejection is respectfully requested.

Respectfully submitted,

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(viii) *Claims appendix.*

1. A method for manufacturing a thermoplastic synthetic integral foam board having a coarsely porous core, sealed and smoothed side surfaces and at least one sealed and smoothed side edge, said method comprising the steps of:

- mixing a thermoplastic synthetic material in an extruder;

- extruding the thermoplastic synthetic material through a wide-slot nozzle to form a flat plastic web having a coarsely porous core;

- cooling and calibrating the plastic web on a calendar roll pair to form sealed and smoothed side surfaces;

- drawing off the plastic web; and

- heating the side edge of the plastic web in a guide groove of a smoothing device to at least a melting temperature of the thermoplastic synthetic material following calibration, while pressing the contact surface of the smoothing device against the-side edge to smooth and densify the thermoplastic synthetic material, thereby to smooth and seal the side edge of the coarsely porous core whi1e simultaneously maintaining adjacent peripheral surface areas of the plastic web in the smoothing device at a temperature below the softening temperature of the thermoplastic synthetic material by cooling.

2. A method as set forth in claim 1, wherein the thermoplastic synthetic material is hard PVC.

4. A method as set forth in claim 1, wherein a longitudinal side of the plastic web is trimmed prior to heating the side edge.

(ix) *Evidence appendix.*

N/A

(x) *Related proceedings appendix.*

N/A